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Identification and Classification of Cabbage Quality using Machine Learning

R. Vishalini [1*], and E. H. M. P. M. Wijerathna[1]

[1]*Department of Information Communication Technology, Faculty of Technology, University of Ruhuna, Matara, Sri Lanka.*

* rechalvishalini@gmail.com

Abstract

Cabbage is a globally usable vegetable which plays an important role in the agricultural industry and in consumer preferences. Traditional methods of visually inspecting cabbage quality are subjective and prone to human error; therefore, this research aims to evaluate the quality attributes of cabbage, focusing on leaf color, head color, and cutworm status. By focusing on advancements in machine learning techniques, specifically convolutional neural networks (CNNs), a model that can accurately classify cabbage quality into categories such as high quality, medium quality, and low quality was trained. This classification enables consumers to make relevant decisions and it is beneficial to the sellers as well. In this research, an extensive dataset of cabbage images was meticulously assembled, along with unique features, utilizing the Redmi Note 10 Pro smartphone. Maintenance of the same lighting conditions was carefully ensured throughout image acquisition of the dataset. In the initial approach, single, pre-trained models named Inception V3, ResNet50, VGG16, and DenseNet121 were applied, yielding accuracy levels of 86%, 55%, 81%, and 82%, respectively. According to the outcomes of the single predefined models, a decision was made to combine together the two models which had the highest accuracies, namely the customized model combining Inception V3 and DenseNet121. A higher accuracy of 88% was achieved through the combined model. The outcome of the study shows a higher accuracy with the combined models, and provides insights into dataset characterization, while contributing to future work.

Keywords*: Cabbage Quality, Feature Extraction, Classification, Convolution Neural Network*